Jan. 29, 1957 W. E. SCHEITHAUER 2,779,131

ANIMATED SUBMERSIBLE TOY

Filed June 14, 1954

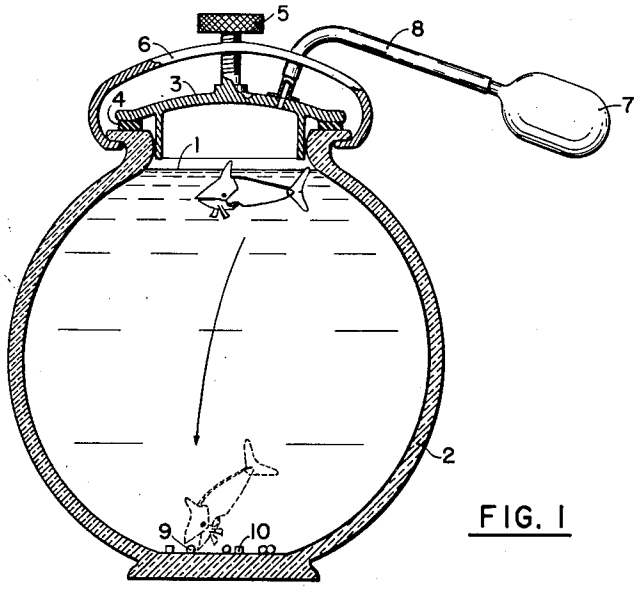


FIG. 1

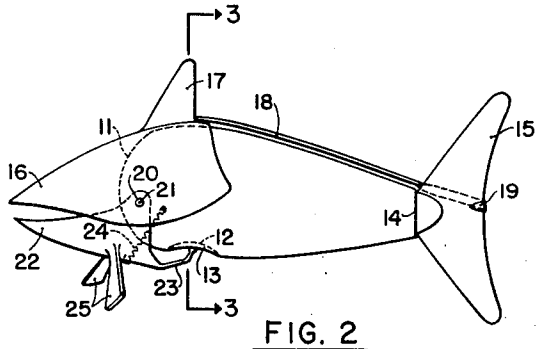


FIG. 2

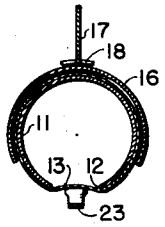


FIG. 3

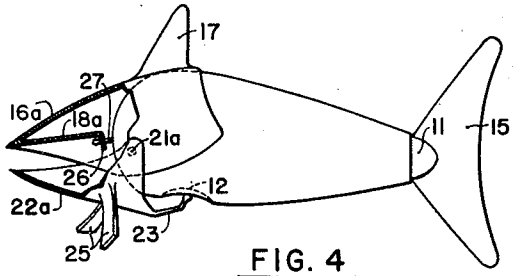


FIG. 4

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ANIMATED SUBMERSIBLE TOY

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6 Claims. (Cl. 46—92)

This invention relates to submersible toys and is particularly concerned with a hydrostatic device in the form of an animated figure, such as a fish, which is adapted to float at or near the surface when immersed in a body of liquid and which descends through the liquid and executes a movement of a gripping member thereof, such as the jaw of the fish, upon the application of pressure to the liquid.

Amusement devices of the Cartesian diver type are known. They are constructed as compressible bodies to displace a variable quantity of liquid or as hollow bodies that admit or expel liquid to alter the weight of the body in accordance with the prevailing pressure so that the weight of the body is slightly less than the weight of the liquid displaced thereby when the pressure is low and slightly greater than the weight of the displaced liquid when the pressure is high. Among such known devices are those in which the center of gravity is altered in relation to the center of buoyancy upon contraction or influx of liquid to cause the devices to alter their inclinations simultaneously with their upward and downward movements.

While prior toys of this type have been amusing, they have not been animated beyond undergoing a minor change in shape without physical contact with the walls of the container which holds the liquid or other mechanical connections. One of the attractions of such amusement devices is their ability to perform movements of external gripping or clamping members that are more or less mystifying and are effected in a lifelike and puzzling manner with no visible connection between the controlling or actuating element and the submersible toy. Further, such prior devices performed no function beyond moving through the liquid and their sole attraction resided in their aspect; they would be more interesting if they were capable of performing some mechanical action or function, such as seizing or gripping and transporting an object, especially if such function were successfully accomplished only occasionally so as to challenge the skill or perseverence of a person operating the toy.

It is an object of the invention to provide a submersible toy having a body and a movable gripping member which will descend and ascend through a body of liqiud while effecting a motion between the body and the gripping member.

A further object is to provide a submersible toy of the type described which can perform a physical action, such as engaging or grasping an object within a body of liquid. A specific object is to provide a diving toy in the shape of an animate creature, such as a fish having a movable jaw, which can descend, open its mouth, hold an object such as a pebble, imitation pearl or a figure of a marine animal that is usually eaten by fish, ascend with said object in its mouth, and release or disgorge the object at any desired level at the will of an operator, the said object resting on the bottom of the container that holds the liquid or being otherwise supported, e. g., by a thread.

In summary, the submersible toy according to the invention includes a hollow body having an opening covered by a flexible diaphragm that is substantially flat at low liquid pressure and is adapted to be forced inwards into said opening upon an increase in the liquid pressure, said body having a movable gripping member an element of which is in engagement with said diaphragm for movement therewith, whereby said appendage is actuated by the deflection of the diaphragm. The gripping member may be biased by gravity and/or by a resilient member for movement in one direction and by the diaphragm for movement in the opposite direction. The said element engaging the diaphragm is usually a lever protruding from the movable appendage and bearing against the diaphragm. By locating the said opening and flexible diaphragm away from the center of buoyancy the inward movement of the diaphragm causes a shift in the center of buoyancy of the body, whereby the body alters its inclination when the pressure in the liquid is increased. The weight of the toy is such that the weight of the liquid displaced thereby exceeds the weight of the toy when the diaphragm is in its outer position but is less than the weight of the toy when the diaphragm is deflected inwardly.

Considered broadly, the invention includes also a toy device as described in the foregoing paragraph wherein the feature of locating the opening and diaphragm away from the center of buoyancy is omitted.

The invention will be described in detail with reference to the accompanying drawing forming a part of this specification and showing two preferred embodiments by way of illustration, wherein:

Figure 1 is a vertical sectional view of a container holding liquid in which the toy is immersed, parts being shown in elevation;

Figure 2 is an elevation of the toy on an enlarged scale;

Figure 3 is a transverse section taken on the line 3—3 of Figure 2; and

Figure 4 is an elevation of a modified construction, parts of the head and movable jaw being shown in section.

Referring to Figure 1 in detail, 1 is the surface of a body of liquid contained in a transparent, glass-walled pressure vessel 2 having a domed closure 3 sealed hermetically by a gasket 4 and pressed downward by a screw 5 having threaded engagement with a strap 6 which engages the annular bead of the vessel. A compressible bulb 7 communicates through a tube 8 with the interior of the vessel. When the bulb is contracted the pressure of the air above the liquid and, hence, the pressure within the liquid are increased; releasing the bulb reduces the pressure. The pressure can be brought to and held at a desired value by compressing the bulb partially. The vessel contains objects, such as imitation pearls 9 and blocks 10, to be engaged by the toy.

The animated toy itself is in the form of a fish having a rigid, hollow body 11 made of sheet metal, plastic material, or the like, and having an ample hole 12 situated at the bottom and near the front, somewhat forwards from the center of gravity of the toy. This hole is covered by an impervious, flexible diaphragm or membrane 13. The hollow body is hermetically closed to contain a fixed quantity of air which may be at atmospheric or at some other pressure. Although not essential to the invention, it was found convenient to attach the flexible diaphragm 13 by forming it as a closed bag having only one open end 14 and inserting the body 11 into the bag with the front end innermost. The bag is advantageously made of elastic material such as rubber

and is circumferentially slightly smaller than the body so as to engage the body snugly and elastically. The bag thereby forms a cover for most of the body and aids in sealing it, whereby the covered parts forwardly of the end **14** need not be of liquid-tight construction. The bag may be suitably colored and decorated with a pattern including fish scales.

The body carries certain external immovable appendages representing parts of a fish, such as a tail **15**, a head **16**, and a dorsal fin **17**, which are secured in any suitable manner. In the embodiment shown in Figures 2 and 3 the tail is integral with or permanently fixed to the rear of the body **11** while the head, to which the fin **17** is integral or permanently fixed, is a hollow body made of sheet material engaging the covered body flatly at the rear of the head and held in place by a thin connecting strap **18**. This strap may be integral with or permanently fixed to the head, extend rearwardly in close proximity to the back of the body, and fastened to the tail, as by crimping the extremity about the tail at **19**. Other arrangements for attaching the head may be used. The head extends forwardly from the body **11** and provides a downwardly directed edge shaped as an upper jaw. The head has a pair of holes **20** (one on each side) situated well to the rear but forwardly of the part of the head that lies flatly on the body to function as sockets for outwardly extending projections **21** of the movable lower jaw **22**.

The jaw **22**, which constitutes the movable gripping member, is shaped as an upwardly concave shell the rear part of which fits within the head at the holes **20** and the front of which presents an upwardly directed edge conforming to the shape of the upper jaw. The front may be directly beneath the front of the head to hold an object by a biting or clamping action; this action is not, however, essential, and the lower jaw can be slightly shorter so that objects are held only within the mouth, resting on the bottom wall of the jaw **22**. The lower jaw has an integral arm or lever extending rearwardly beyond the transverse axis of the pivots **21**, the rear extremity of the arm being inclined upwards to engage the membrane **13** at the center of the hole **12**. The arm is shaped to engage the membrane while in the outer, substantially flat condition assumed when the liquid pressure is low with the jaw closed. The pivots **21** are situated well to the rear of the center of gravity of the jaw **22**, whereby gravity tends to lower the front of the jaw. In addition to or in lieu of this positional relation a resilient member, such as a weak tension spring **24**, which may be concealed within the head and jaw, is connected toward the rear of the pivot axis to bias the jaw toward open position. The stiffness of the spring **24** is such that the force of the membrane **13** against the arm **23** overpowers the spring, holding the jaw closed until the membrane is deflected into the hole by liquid pressure. Fins **25** are mounted immovably on the lower jaw.

The weights of the head, jaw and tail are such that the center of gravity is beneath the center of buoyancy when the fish is immersed in horizontal position as shown in solid lines in Figure 1. Further, the entire weight of the fish is slightly less than the weight of liquid displaced thereby at low pressure, which may be atmospheric pressure. When the bulb **7** is squeezed the pressure within the vessel **2** is increased and the membrane **13** is deflected into the hole **12**, causing a slight compression of the air within the body **11**. This decreases the displacement of the fish sufficiently to cause it to descend. Because the decrease in liquid displacement occurs at the hole **12**, which is to the front of the center of gravity while the fish is horizontal, the center of buoyancy is shifted slightly toward the tail; this causes the head to descend in relation to the tail. The inward deflection of the membrane further permits the end of the arm **23** to rise, whereby the tension spring **24** contracts and the jaw opens. The resulting condition and position of the fish while diving are indicated in dotted lines.

When the lower jaw engages an object **9** or **10** the bulb **7** is released, thereby decreasing the liquid pressure; this permits the membrane **13** to return to its outer, substantially flat position. This return movement has the three consequences of increasing the displacement so that the fish ascends; of shifting the center of buoyancy slightly toward the head so that the head rises until the fish is almost horizontal; and of moving the end of the arm **23** down so that the jaw is closed. When the jaw closes an object **9** or **10** is seized and held, provided the fish was at the correct position in relation to the object at the instant that the bulb **7** was released. The object may be held in either of two ways: Objects of suitable outline or texture, such as the blocks **10**, can be clamped between the front part of the head and the lower jaw with a biting action, while either type of object can be scooped up and be held within the mouth, simulating a swallowing action. The object can be released at any time, such as prior to ascent or after partial or full ascent to the surface **1** by momentarily squeezing the bulb **7**, which causes the mouth to open and close. This gives the appearance of a fish disgorging the object.

It was found that only very small dense objects such as imitation pearls can be held in the mouth without making the fish relatively heavier at the nose. To permit the fish to ascend in the horizontal position or with the head slightly raised the object should have density that is only slightly higher than that of the liquid, preferably with a specific gravity above 1 and less than 1.2, e. g., a spongy body with a specific gravity of 1.1.

Because the horizontal location of the fish cannot be controlled directly and the horizontal movement is mainly that induced by the fin surfaces while the fish is descending or ascending, the fish will only occasionally be in a position suitable for seizing an object; it is therefore necessary to release the bulb **7** at the opportune moment to pick up the object. The device can, therefore, be used as an amusement device that requires a certain degree of skill and patience to lift the object from the bottom of the vessel.

It will be appreciated that numerous changes can be made in the dtails of the toy without departing from the scope of the appended claims and that the toy may be given the form of animate creatures other than fish. Similiarly, the movable gripping member need not be an organic part of the creature but may be in the form of an implement, e. g., a clamshell bucket held by a human figure.

Certain variants are shown in Figure 4, wherein like reference numbers denote parts described for Figures 2 and 3. This embodiment differs in the construction of the head and movable jaw and the arrangement for attaching the head. The fish includes a hollow body with a ventral opening covered by a flexible bag and having an integral tail, as before. The head **16*a*** is attached without a dorsal strap and has, instead, an internal strap **18*a*** the extremity of which is bent down, perforated and split to form an ear **26** that has a snap or resilient engagement with a support pin **27**. This pin is permanently fixed to the front of the body **11** and may have an enlarged head. The membrane bag **13** is impaled on this pin before attaching the head. The lower, movable jaw **22*a*** is wider than the head to fit on the outside of it and the pivot pins **21*a*** in this case extend inwardly. The jaw is attached to the head by spreading the rear portions of the jaw resiliently and releasing them to cause the pins to enter the socket holes in the head. The resilient spring **24** is omitted in this embodiment.

I claim as my invention:

1. A toy adapted for submersion in a liquid having a hollow, hermetically sealed body containing a gas, an opening therein, and an external abutment; a flexible memberane covering said opening and adapted for in-

ward deflection upon the application of liquid pressure; an external gripping member movably mounted on said body and having a part thereof disposed to close on said abutment; and means including an actuating element on the gripping member engaging the diaphragm for actuating the gripping member upon deflection of the diaphragm.

2. A toy according to claim 1 wherein said opening in the body is displaced from the center of gravity of the toy, whereby the center of buoyancy is shifted upon inward deflection of the membrane.

3. A toy according to claim 1 wherein said memberane is an elastic bag extending around and elastically enclosing a part of said body including said opening in hermetically sealing relation and leaving a part of said body uncovered, said external gripping member being attached to said uncovered part of the body.

4. A toy according to claim 1 including resilient means connected between said gripping member and the body to urge said gripping member away from the abutment in opposition to said membrane, whereby the gripping member is closed when the membrane is in substantially flat condition.

5. A toy fish adapted for submersion in a liquid having a hollow, hermetically sealed body containing a gas and having a opening at the bottom thereof displaced toward the front from the center of gravity of the toy; a flexible membrane covering said opening and adapted for

inward deflection upon the application of liquid pressure; non-movable appendages including a head and a tail on said body; a lower jaw mounted on said head for movement about a transverse pivot axis and shaped to hold an object when closed upwardly against the head, said jaw having an element extending rearwardly from said pivot axis and engaging the outer face of said membrane at said opening so that the membrane urges the jaw to said closed position when substantially flat and releases the jaw for movement to open position when deflected inwardly, the weight of said liquid displaced by the fish being greater than the weight of the fish prior to inward deflection of the membrane and being less than the weight of the fish after inward deflection.

6. A submersible toy fish according to claim 5 including resilient means connected between said jaw and head to urge said jaw toward open position in opposition to said memberane, said resilient means being weaker than the force of the membrane, whereby the jaw is closed when the membrane is in said substantially flat condition.

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